

CLAIMS

1. A rotational angle detecting apparatus comprising:
 - a plurality of detecting means, disposed respectively to face a target made of a magnetic material and provided on a rotating member, for detecting the target and outputting detection signals having phases according to the position of the target which changes with a rotation of the rotating member;
 - operating means for operating a predetermined operation on the detection signals respectively outputted from the detecting means;
 - converting means for converting a result of the operation operated by the operating means into the electrical angle of the detection signals based on ones of a plurality of tables and a plurality of conversion formulas, said tables representing the correlation of each operation result obtained by operating the predetermined operation by the operating means in advance for different gaps between the target and the detecting means with a corresponding electrical angle of the detection signals, and said conversion formulas representing the relationship between the operation result and the electrical angle of the detection signals for different gaps between the target and the detecting means; and
 - determining means for determining the gap based on the detection signals respectively outputted from the detecting means, wherein

the converting means converts the result of the operation operated by the operating means into the electrical angle of the detection signals based on one of the table and the conversion formula corresponding to the gap determined by the determining means, and detects a rotational angle of the rotating member based on the obtained electrical angle.

2. The rotational angle detecting apparatus according to claim 1, comprising:

means for determining whether or not the gap determined by the determining means is one of the gaps corresponding to ones of a plurality of the tables and a plurality of the conversion formulas; and

calculating means for calculating the electrical angle of the detection signals by interpolation based on ones of two tables and two conversion formulas corresponding to two gaps on both sides of the gap determined by the determining means, if the determination result by the means is negative.

3. The rotational angle detecting apparatus according to claim 2, wherein

the calculating means calculates the electrical angle of the detection signals based on the operation results obtained by operating the predetermined operation by the operating means in advance for two gaps on both sides of the gap determined by the

determining means, the electrical angles of the detection signals obtained by converting the operation results by converting means, and the result of the operation operated the predetermined operation on the detection signals respectively outputted from the detecting means by the operating means.

4. A rotational angle detecting apparatus comprising:
a plurality of detectors, disposed respectively to face a target made of a magnetic material and provided on a rotating member, for detecting the target and outputting detection signals having phases according to the position of the target which changes with a rotation of the rotating member; and
a controller capable of performing operations of
executing a predetermined operation on the detection signals respectively outputted from the detectors;
storing ones of a plurality of tables and a plurality of conversion formulas, said tables representing the correlation of each operation result obtained by executing the predetermined operation in advance for different gaps between the target and the detectors with a corresponding electrical angle of the detection signals, said conversion formulas representing the relationship between the operation result and the electrical angle of the detection signals for different gaps between the target and the detectors;
determining the gap based on the detection signals

respectively outputted from the detectors;

converting the result of the executed operation into the electrical angle of the detection signals based on one of the table and the conversion formula corresponding to the determined gap; and

detecting a rotational angle of the rotating member based on the obtained electrical angle.

5. The rotational angle detecting apparatus according to claim 4, wherein

the controller determines whether or not the determined gap is one of the gaps corresponding to ones of a plurality of the tables and a plurality of the conversion formulas, and

calculates the electrical angle of the detection signals by interpolation based on ones of two tables and two conversion formulas corresponding to two gaps on both sides of the determined gap, if the determination result is negative.

6. The rotational angle detecting apparatus according to claim 5, wherein

the controller calculates the electrical angle of the detection signals based on the operation results obtained by executing the predetermined operation in advance for the two gaps on both sides of the determined gap, the electrical angles of the detection signals obtained by converting the operation results, and the result of the

operation executed the predetermined operation on the detection signals respectively outputted from the detectors.

7. A torque detecting apparatus comprising:
the rotational angle detecting apparatus as set forth in
claim 1 provided for each of a first shaft and a second shaft
connected by a connection shaft; and
detecting means for detecting a torque applied to one of the
first shaft and the second shaft based on rotational angles of the
first shaft and the second shaft detected by the rotational angle
detecting apparatuses provided for the first shaft and the second
shaft, respectively.

8. A torque detecting apparatus comprising:
the rotational angle detecting apparatus as set forth in
claim 2 provided for each of a first shaft and a second shaft
connected by a connection shaft; and
detecting means for detecting a torque applied to one of the
first shaft and the second shaft based on rotational angles of the
first shaft and the second shaft detected by the rotational angle
detecting apparatuses provided for the first shaft and the second
shaft, respectively.

9. A torque detecting apparatus comprising:
the rotational angle detecting apparatus as set forth in

claim 3 provided for each of a first shaft and a second shaft connected by a connection shaft; and

detecting means for detecting a torque applied to one of the first shaft and the second shaft based on rotational angles of the first shaft and the second shaft detected by the rotational angle detecting apparatuses provided for the first shaft and the second shaft, respectively.

10. A torque detecting apparatus comprising:
the rotational angle detecting apparatus as set forth in
claim 4 provided for each of a first shaft and a second shaft
connected by a connection shaft; and

a controller capable of performing operations of
detecting a torque applied to one of the first shaft and the second shaft based on rotational angles of the first shaft and the second shaft detected by the rotational angle detecting apparatuses provided for the first shaft and the second shaft, respectively.

11. A torque detecting apparatus comprising:
the rotational angle detecting apparatus as set forth in
claim 5 provided for each of a first shaft and a second shaft
connected by a connection shaft; and
a controller capable of performing operations of
detecting a torque applied to one of the first shaft and the second shaft based on rotational angles of the first shaft and the

second shaft detected by the rotational angle detecting apparatuses provided for the first shaft and the second shaft, respectively.

12. A torque detecting apparatus comprising:
the rotational angle detecting apparatus as set forth in
claim 6 provided for each of a first shaft and a second shaft
connected by a connection shaft; and
a controller capable of performing operations of
detecting a torque applied to one of the first shaft and the
second shaft based on rotational angles of the first shaft and the
second shaft detected by the rotational angle detecting apparatuses
provided for the first shaft and the second shaft, respectively.